NOVEMBER/DECEMBER 2024

23PPH11 — MATHEMATICAL PHYSICS

Time : Three hours | Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Give example for a vector space.
2. What is the Gram-Schmidt orthogonalization process?
3. State "de Moivre's" theorem.
4. What are the Cauchy-Riemann conditions?
5. Write a short note on Hermitian matrix.
6. What is Cayley-Hamilton theorem?
7. Infer the Fourier transform.
8. What is convolution theorem?
9. Summarize the Sturm-Liouville problem.
10. Compare the Hermite polynomials.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Develop the process of changing the basis in a vector space.

Or

(b) Describe the properties of scalar products in vector spaces.

12. (a) Identify the concept of contour integration.

Or

(b) Examine the Cauchy Integral Theorem.

13. (a) Explain the process of diagonalization of a matrix.

Or

(b) Discuss the properties of Hermitian matrices.

14. (a) Utilize the application of Fourier transforms in solving the diffusion equation.

Or

(b) Apply the Laplace transform of integrals.

15. (a) Explain the orthogonality properties of Legendre polynomials.

Or

(b) Describe the concept of a Green's function in differential equations.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Estimate the isomorphism of vector spaces and its significance in linear algebra.

17. Create a comprehensive explanation of how the residue theorem can be applied to solve real-world problems.

18. Discuss the application of eigenvalues and eigenvectors in solving linear equations.

19. Formulate the application of Laplace transforms in solving potential problems in a semi-infinite strip.

20. Construct a detailed explanation of how orthogonal polynomials can be used to solve complex differential equations.

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